

Invasive Plant Risk Assessment and Project Design Features
Somes Bar Integrated Fire Management Project
Orleans and Ukonom Ranger Districts

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Invasive Plant Risk Assessment

Policy

In accordance with the policy within Forest Service Manual 2900 Invasive species management (USDA/USFS 2011), the Forest shall abide by the following as a component of project decision document:

- Determine the risk of introducing, establishing, or spreading invasive species associated with any proposed action, as an integral component of project planning and analysis, and where necessary provide for alternatives or mitigation measures to reduce or eliminate that risk prior to project approval.
- Ensure that all Forest Service management activities are designed to minimize or eliminate the possibility of establishment or spread of invasive species on the National Forest System, or to adjacent areas.

Determination of Risk

Risk is evaluated in an assessment for this project based five indicators: 1) presence of known invasive plant species in the project area, 2) habitat vulnerability, 3) non-project-dependent vectors such as existing roads or trails, adjacent private property, 4) habitat alteration expected as a result of project implementation, and 5) increased vectors as a result of project implementation.

As a result of survey conducted by Mid Klamath Watershed Council, six invasive plant species were mapped. The focal areas with the highest diversity of invasive plants and cover were those in the north of the project area: Ti Bar, Patterson, and Rogers. In contrast, Donahue focal area was relatively clear likely due to its distance from CA Highway 96 and the Klamath River, both majors vectors for invasive species. Himilayan blackberry was the most widespread species, associated with stretches of road, within riparian areas adjacent to roads and within unit interiors. Blackberry in the northern-most focal areas was almost continuous within the first 1.5-2.0 miles on roads accessing the respective areas and along CA Highway 96 which dissects the western-most edge of the northern focal area.

Other species, specifically yellow starthistle, dyer's woad, dala-mation toadflax, scotch broom, butterfly bush and tree of heaven, were primarily associated with portions of the focal areas adjacent to CA Highway 96—those portions dominated by invasive plants—and road edges or clearings (e.g. turn-outs, existing landings, disposal sites) relatively close to CA Highway 96. These species were only sporadically observed higher up in the focal areas.

An exception to the light requirements of most invasive plant species, once established, Himilayan blackberry can persist in both light and shade. This species presence in association with riparian areas is an indicator. While present in shady settings, fruit production is limited (Hoshovsky 2017), thereby reducing the potential for spread by wildlife through injestion. Seedling growth is also inhibited by shade. Asexual reproduction by way of trailing canes that root at the tips can produce blackberry thickets up to 5 meters (approximately 15 feet) in diameter in less than two years (Soll 2004).

Roads, in particular highways, river bars and private in-holdings are vulnerable settings to the introduction and spread of invasive species. Invasive plants are highly adapted to settings that are chronically disturbed and with little to no shade. Seeds of these plants, or in the case of Himalayan blackberry—canes—of this plant, can be inadvertently introduced to new areas on vehicles or equipment (the latter used in road maintenance), mixed in with gravel used for road maintenance, attached to domestic animals, or imported on rock/gravel/straw or other material used on private property. Once introduced, seed banks for some of these species can last a decade or more and germinate when subjected to scarification (alteration of the seed coat) by mechanical or thermal means.

Given the species, their ecology and their geographic distribution within the focal areas, the activities associated with implementation of this project that would increase the risk of invasive plant introduction and spread include use of heavy equipment, staging equipment at sites with invasive plants (e.g. yellow starthistle), reducing canopy cover proximal to occurrences of invasive plants, creation of landings and use of existing landings where invasive plants already exist or are nearby, prescribed burning that removes native vegetation (i.e. forbs, shrubs, small trees) which provides competition and functions as a barrier to movement of invasives from the road edge down into the unit.

In light of the five factors above for assessment risks, this project carries with it a moderate to high risk of spread as a result of implementation, especially with the presence of Himalayan blackberry widespread along some road edges, within riparian areas and its capacity for reproduction by cane development. It is important to note that there are settings within the focal areas specifically associated with CA Highway 96 and the Klamath River, as well as along the lower stretches of FS access roads—stretches closest to Highway 96-- that are already very compromised in terms of invasive plant cover and the array of species present. Without significant investment, activities proposed in these setting, specifically manual treatments and prescribed burning, are not likely to change the current condition—risk of spread is considered high, regardless of the activities.

While management of invasive plants are limited in these settings project design features, specifically progression of work, where mechanical operations begin in areas of the respective focal areas that have relatively few sites of invasive species before operating in areas with a high cover of invasives, aims to reduce the risk of introduction of invasive plant material (i.e. seed, canes) by equipment. Similarly, cleaning of equipment (high-pressure water system) used in one focal area before moving to another focal area will aim to reduce the risk of invasive plant introductions to the next focal area.

Project Design Features to Reduce Risk

In keeping with Forest Service policy on Invasive Species Management (FSM 2900); the following design features are identified to reduce the risk of introduction and spread from its current risk rating. The design features for managing Himalayan blackberry, the primary invasive in the project area, are drawn from literature review (Bennett 2007, Caplan and Yeakley 2006, Hoshovsky 2015, Soll 2004) and limited relative to on-the-ground implementation on Six Rivers. As such, the treatments are considered “experimental”, thus the design features provide for an adaptive approach related to the burn return interval if the objective of the design feature is not being met.

The areas for treatment are those where the invasive species exists as small to moderate site (a sub-set where cultural use species were observed), geographically disjunct from larger or extensive sites, associated with riparian areas, or associated with landings. Design features will be included in contract

specifications, burn plans, unit cards and other documents associated with the details of implementation. Priority areas for treatment along FS routes will also be flagged in the field prior to treatment. Specifics related to these design features, including specific units, timing and sequence, are captured in Appendix A of this document and the appendix of the Environmental Assessment and in Geographic Information Systems shapefiles with attributes to be used for implementation maps and contracts as needed.

Implementation of the following design features or prescriptions and monitoring will reduce the risk of introduction and spread of invasive plant species from a high risk to a low risk where roadside invasive occurrences are small in size and discrete and moderate risk where occurrences are moderate in size or associated with riparian areas.

Mechanical/Mastication Units:

Overarching Project Design Features

- All mechanical equipment used in the project, including equipment related to road maintenance, shall be pressured washed prior to operating on the Forest (USDA/USFS 2014).
- All mechanical equipment used in the project shall be washed after operating in one Focal Area, before moving to another Focal Area.
- As a part of contract specifications, treatment of mechanical units shall follow a **progression of work** schedule, whereby treatment occurs first where invasive plants are limited to non-existent before moving to heavily infested areas (e.g. units along sections of FS access routes within 1.0 miles of Highway 96). If progression of work is not feasible, equipment operating in heavily infested units or Focal Areas shall be cleaned before relocating (USDA/USFS 2014). Progression of work applies to road maintenance associated with this project as well (see Appendix B).
- Avoid yarding/skidding through Himalayan blackberry patches prioritized for treatment.
- As a part of contract specifications, before using existing landings occupied by invasive plant species, mechanically remove the plants to the edge of the landing, away from where equipment will be operating; pile and subsequently burn. Depending on the size of the occurrence, follow up with prescribed burning in an attempt to contain the occurrence at the landing may be warranted. Adapt burn interval as applicable to meet the intent of the design feature.
- Avoid masticating sections of FS routes occupied by Himalayan blackberry as well as Himalayan blackberry dominated areas of a given unit.
- Where Himalayan blackberry occurs in inner and outer riparian areas within the unit, correlate retention patches in the prescription with this setting to maintain shade and reduce fruit production and seedling establishment.

Site Specific Invasive Plant Treatments (see Table 1 for units associated with the sites and treatment)

PDF Treatment #1- Small sites

1. Where Himalayan blackberry (blackberry) exists as a disjunct/discrete site with few plants (<10 plants) or as a small patch (< 0.01 acres/est. 435 sqft),
 - include treatment area in a retention mosaic for *mechanical units* OR Retain an estimated 20 feet of native vegetation around treatment site for *manual, rx burn units*,
 - avoid operating equipment or yarding logs across retention areas,
 - manually grub out the plant including root crown, (with pulaski or similar tool) before plant flowers in the spring, taking care not to damage roots of any native vegetation at the site,
 - remove pulled plants from site, re-locate to a nearby burn pile,
 - monitor in the fall,
 - repeat treatment annually until eradicated, then,
 - implement prescribed burning activities according to prescription,
 - based upon monitoring, adapt approach as needed to meet the intent of the design feature.
 - RECOMMENDATION: Consider active revegetation with native plants that will provide competition (options: Douglas fir, Ca bay, deerbrush) and defer prescribed burning by until revegetation is stable.
- 1a. Where Tree-of-Heaven exists as disjunct/discrete site with a few stems
 - Include in retention area or retain an estimated 20 feet of native vegetation around the site,
 - manually remove trees when ground is moist or workable to best ensure root removal (dig or use trailer/towing winch),
 - monitor in the fall,
 - repeat annually until site is eradicated,
 - implement prescribed burning activities according to prescription.

PDF Treatment #2 Moderate Sites

2. Where blackberry exists as a moderately sized patch (example- 0.02 acres/est. 1152 sqft)
 - include treatment area in a retention mosaic for *mechanical units* OR retain an estimated 20 feet of native vegetation around treatment site for *manual, rx burn units*,
 - avoid operating equipment or yarding logs across the retention area for *mechanical units*,
 - remove above-ground blackberry canes (weed whack or similar) before plant flowers in the spring,
 - scatter or pile blackberry canes where removed,
 - follow-up in the fall with a prescribed burn over the removed canes,
 - monitor in the spring,
 - repeat annually (above-ground cane removal and burning or if a few plants, manual grubbing) until eradicated,
 - implement prescribed burning activities according to prescription,

- based upon monitoring, adapt approach as needed to meet the intent of the design feature.
 - implement prescribed burning activities according to prescription,
 - based upon monitoring, adapt approach as needed to meet the intent of the design feature.
 - RECOMMENDATION: Consider active revegetation with native plants that will provide competition and defer burning by prescription until revegetation is stable.
- 2a. Where blackberry exists as a linear feature along a short stretch of road (0.1 miles)
- implement items above, but only repeat treatment if monitoring in the spring after weed whacking and burning indicates the cover of blackberry is reduced.

PDF Treatment #3 Landings

3. **Before using the landing**-where blackberry exists as a small site
- mechanically remove blackberry by blading down to ground surface, pile on site away from operations,
 - subsequently pile burn on landing,
 - follow up, with blackberry cane removal (weed whack or similar) or if few plants, manually grub out blackberry before plant flowers OR prescribe burn over blackberry patch,
 - monitor a year after treatment,
 - repeat annually until eradicated,
 - based upon monitoring, adapt approach as needed to meet the intent of the design feature.
- 3a. **Before using landing**- where blackberry exists as a large site
- mechanically remove blackberry by blading down to ground surface, pile on site away from operations,
 - subsequently pile burn on landing.
4. **Other settings**-where blackberry exists as a large site, along a stretch of road associated with mechanical units or manual burn units:
- include 10-15' of native vegetation around blackberry on the road edge of units in the retention mosaic or for manual units, a 10-15' native vegetation buffer.

Opportunities for additional treatment

The majority of other invasive plants are adjacent to CA Highway 96, the Klamath River bar, and along the lower stretches of FS routes accessing the focal areas. Given the predominance of invasives in this setting, the vectors associated with the highway and river bar, the implementation of a progression of work schedule (operate) for mechanical treatments, and the application of either manual/prescribed burning or prescribed burning treatments), the risk of introduction and spread as a result of project implementation would not change from its current condition.

With the exception of a disposal site in the Rogers Focal area, the risk of introduction and spread elsewhere is considered low as invasive plant sites are associated with road sides, relatively small in size

and correspond with manual treatments and prescribed burning (compared to mechanical treatments which incorporate heavy equipment). Manual treatments coupled with pile burning and prescribed burning actually create an opportunity to manage isolated, relatively small sized occurrences of invasive species other than *Rubus*. Species include: tree of heaven, dyer's woad, yellow starthistle, and scotch broom.

- Where yellow starthistle, dyer's woad, scotch broom or tree of heaven exist as isolated sites, with a relatively low number/cover of plants (e.g. <0.02 acres),
 - manually pull or use tools to remove individual plants in the late spring of the year (before fruiting/seeding) ensuring removal of the roots as much as possible,
 - pile treated plants and burn where treated or if plant numbers are few, incorporate plant material into a nearby, burn pile,
 - include treated areas in the prescribed burn footprint,
 - prescribe burn within three years of treatment,
 - adapt burn return interval to meet the intent of the design feature as applicable.

Table 1. Focal Areas and Units that include Invasive Plant Treatment sites

FOCAL AREA	Prescription	Unit #	Treatment Type (see above for description)
Ti Bar	Manual, Rx Burn	2115	1
	Manual, Rx Burn	2115	2
	Mechanical, Ground	2117	1
	Mechanical, Cable	2124	1
	Manual, Rx Burn	2162	2
	Mechanical, Ground	2116	2
Patterson	Manual, Rx Burn	2291 (3 sites)	1
	Manual, Rx Burn	2290	1
	Mechanical, Ground	2230	1
	Mechanical, Ground	2230	3-landing
	Mechanical, Ground	2227	3a-landing
	Mastication	2229	3a-landing
	Mechanical, Ground	2217	3a-landing
Rogers	Manual, Rx Burn	2361	1
	Manual, Rx Burn	2314	1
	Mechanical, Cable	2320	2
	Manual, Rx Burn	2312	2
	Mechanical, Cable	2321	2
	Manual, Rx Burn	2352	1
	Manual, Rx Burn	2309	1
	Manual, Rx Burn	2361	1
	Manual, Rx Burn	2307/2361	1-both sides of road
	Manual, Rx Burn	2322	1
	Mechanical, Cable	2336 (2 sites)	3-landing
	Mechanical, Cable	2336	2
	Manual, Rx Burn	2258	1a-tree of heaven

	Manual, Rx Burn	2332	2
Rogers cont.	Manual, Rx Burn	2327	2
	Manual, Rx Burn	2323	2
	Manual, Rx Burn	2355	2
	Manual, Rx Burn	2322	2
	Mechanical, Ground	2328	2
Donahue	Mechanical, Cable	2425	1
	Mechanical, Ground	2412	3
	Mastication	2412	3
	Mastication	2413	3
	Mechanical, Road	2434	1
	Manual, Rx Burn	2471	1
	Mechanical, Ground	2463	1
	Manual, Rx Burn	2509	1
	Mechanical, Ground	2452	3a-landing
	Mechanical, Ground/Mechanical, Road/Manual, Rx Burn	2452, 2431/2458/2430	4-stretch of road
	Mechanical, Ground/Mechanical, Road	2452/2431	3a-landing
	Mechanical, Ground	2400	4-stretch of road

For Monitoring Plan

- Adaptive management for treatment of himilayan blackberry as described above would necessitate periodic monitoring and evaluation of treatment efficacy so that prescriptions can be adjusted as needed.
- Where yellow starthistle, dyer's woad, scotch broom, dalmation toadflax or tree of heaven exist as isolated sites, with a relatively low number/cover of plants (e.g. <0.02 acres),
 - for dyer's woad, scotch broom, dalmation toadflax and tree of heaven, manually pull or use tools to remove individual plants in the late spring of the year (before fruiting/seeding) ensuring removal of the roots as much as possible,
 - pile treated plants and burn where treated or if plant numbers are few, incorporate plant material into a nearby, burn pile
 - for yellow starthistle, manually pull or use tools to remove individual plants in early summer of the year (before fruiting/seeding) and again in September ensuring removal of the roots as much as possible, bag treated plants and locate to a site for subsequent burning
 - monitor annually and retreat as necessary and until no plants persist,
 - include treated areas in the prescribed burn footprint,
 - prescribe burn within one year of treatment,

- adapt burn return interval to meet the intent of the design feature as applicable.

Appendix A. Progression of Work-Somes Bar Integrated Fire Management Project

The following table displays the Progression of Work (POW) for this project. The objective of POW is to reduce the risk of spread of invasive plant species from an area of high invasive plant cover (primarily associated with road edges, clearings, and landings) to one of relatively less or no cover of invasive plants. POW will be included in the contract for this project and in road engineering contracts associated with project implementation.

If POW cannot be implemented, then contractor shall clean equipment operating in any of the units associated with the section of road identified below before operating elsewhere in the respective Focal Areas.

Equipment shall be cleaned prior to coming onto the project area AND between Focal Area operations.

FOCAL AREA	Prescription	Unit #*	Road Segment
Ti Bar	Mechanical Road	2157, 2158, 2120, 2119	Units on 13N11, south of private property
	Mechanical Ground	2145	Units along lower section of 13N11, near Hwy 96
Patterson	Mechanical Ground	2264, 2265, 2266, 2272, 2217, 2218, 2242, 2200, 2203, 2260	Units along the stretch 13N12 from intersection with 13N12A intersection south to Hwy 96 and Units along 13N12A
Donahue	Mechanical Ground	2474, 2480, 2481	Units along 13N14A
	Mastication	2487, 2484, (2486, 2490, 2489)	Units along 13N14A. (Latter three units accessed by existing temp roads off of 13N14A

***Units listed are those immediately adjacent to the road sections of concern; if a unit is to be accessed by another road for operations, then POW would not need to apply**

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